

Philosophical
ESSAY
OF
MUSICK

Directed to a
FRIEND.

Feb. 3^d
167^e₇

Imprimatur,

Guil. Sill.

L O N D O N,

Printed for *John Martyn*, Printer to the Royal
Society ; at the *Bell* in *Saint Paul's*
Church-Yard, 1677.

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SIR,

Having often tyred you with Discourses of several Parts of Musick, wherein you desired to receive satisfaction, without obtaining the Effect I proposed to my self; I reflected upon the saying, That no man understands that which he cannot so express as to make another understand it, and doubted whether the Hypothesis I entertained were not founded upon Errors, which I had swallowed without any due examination. I resolved for tryal of it, to trace my Notions as near their Principles as I could, and set them down in method, that I might discover whether they were well deduced from one another, and from such Experiments as I had in memory. Having done this I send them to you, as the severest judge I know: It has not been your custome to flatter me, and now I desire your censure, if I may impose it upon you to give it in writing, wherein you will be obliged to quote what I say truly, before you object to it, and to stand to those Allegations and Inferences you will set down for your own, in both which respects I had great disadvantage in Discourse. I shall prevent you in condemning the stile, for being too contracted and obscure; and you must take the fault to your self when you know it does not proceed from the aversion I have to Philologie, but that I thought it would be labour lost to enlarge, when writing to so great a Philosopher and Musician as you are, I cannot fail of being understood.

In other things I expose it to you; and if I shall receive plain Confutations, it will not much disappoint or mortifie me: for I have hardly in my whole Life made one set experiment upon this Subject, nor know many of the Instruments I have spoken of: But what I heard from others, or occasionally observed, I laid up in mind, and established this Systeme, which I shall be glad to lose, if I may improve my Knowledge by your Discoveries. This may seem strange to you, considering how fond men are of their own Inventions: At the worst, I hope for this fruit of my pains, that you will make such Experiments as your Curiosity will suggest whilst you read this, and let me know the success of them; though I may thereby be driven out of this Hypothesis, perhaps I shall receive light towards another, which you may believe I shall take as much pleasure in making, as you, or any body else can to destroy.

I am, SIR,

Your most Faithfull Friend

and Servant.

Of

Of SOUND.

MY design being to explain the nature of *Musick* it will not be improper to enquire first, concerning the cause of Sound; and here though I cannot hope to give full satisfaction, because our Senses want subtilty to discover the motions of the minute parts of the Air whereupon it depends, yet perhaps I may assign a possible cause for the producing of Sound, the knowledge whereof will give some ease to the wondring Philosopher; and if I have the good fortune to shew a probable cause, the Curious will acquiesce from any farther enquiry, which is all the benefit they can have by speculations of this nature.

The *Phenomena* of *Sound* which I think considerable are these, 1. It may be produced in the Torricellian vacuum. 2. It causes motion in solid bodies. 3. It is diminished by interposition of solid bodies, and 4. If the bodies interposed are very thick, its passage is wholly obstructed. 5. It seems to come to the Ear in strait lines when the object is so situated that it cannot come in a straight line to the Ear. 6. When the air is not in motion its extent is *spherical*. 7. When there is a wind, the *sphere* is enlarged on that part to which the wind blows, and diminished on the contrary part. 8. That it arrives not to the Ear in an instant but considerably slower than sight. 9. That it comes as quick against the wind as with it, though not so loud nor so far.

There are many other observable Appearances, and more will daily occure to the Curious upon Experiments, but the consideration of these qualities of *Sound* and the visible actions that produce it, hath made me entertain the following Hypothesis.

I suppose the air we breath in to be a mixture of divers minute bodies which are of different sorts and sizes, though all of them are so small as to escape our senses: the grosser of them are elastical, and are resisted by solid bodies, which are in no sort pervious to them; the smaller parts pass through solid bodies, but not with that ease but that upon a sudden and violent start of them, they shock the parts of solid bodies that stand in their way, and also the grosser parts of the air; and there may be another degree of most subtil Ethereal parts with which the interstices of these and all other bodies are repleat, which find freer passage every where, and are capable of no compression, and consequently be the medium and cause of the immediate communication of sight. The middle sort of these I esteem the medium and cause of *Sound*, and that at any time when the grosser air is driven off any space and leaves it to be posselt by these and other more subtil bodies, and returns by its elasticity to its former place, then are these parts extruded with violence as from the center of that space, and communicate their motion as far as the sound is heard.

Or when any solid body is moved with a sudden and violent motion, these parts must be affected thereby: for as these parts are so much resisted by solid bodies as to shock them, so on the contrary they must needs be moved by the sudden starting of solid bodies.

So that sound may be caused by the tremble of solid bodies without the presence of gross Air, and also by the restitution of gross Air when it has been divided with any violence.

We see a Bell will sound in the Torricellian space: and when the Air is divided with any sudden force, as by the end of a Whip having all the motion of the Whip contracted in it, and by a sudden turn throwing off the Air; by accension, as in Thunder and Guns; or by any impression of force carrying it where other Air cannot so forcibly follow, as upon compressing of Air in a bladder till it breaks, or in a Potgun, a sudden crack will be caused. I

I shall leave others to apply this Hypothesis to the afore mentioned *Phænomena* (which they may easily do) and proceed to the discourse of *Musick*, where I am in its due place to shew how this action that causes sound is performed by the several instruments of *Musick*.

Of a TONE.

A Tone is the repetition of Cracks or Pulses in equal spaces of time so quick that the interstices or intervals are not perceptible to sense.

The more quick the Pulses are, the more acute the *Tone* is. Where the intervals are not equal, nor in musical proportion, the sound is not in *tone* but an irregular noise.

The compass of *Musick* extends from such *tones* whose intervals are so great that the several Pulses are distinguishable by sense, to those whose interstices are so very small that they are not commensurate with any other.

In which compass the several *tones* are infinite in number as all space may be divided in *infinitum*. But the *tones* useful in *Musick* are those within the scale, which are not very many, and they are placed in the scale as they have relation to one another.

Of the Relation of TONES and the Union of mixt SOUNDS.

WHen the Pulses of *tones* are coincident one with the other, there is an Union of the *sounds*.

For when any *Sound* is made, solid bodies whithin the *sphere* of it are moved, and if the body moved stands upon a spring (as all instruments producing *tones* do) it will vibrate by intervals according to the measure of the spring until the force be spent.

Now if the moving force be repeated, as it must be where

it proceeds from a *tone*, and the terms of the force are equal to the terms of vibration, every new stroke strengthens the former impressi^on, and after some continuance the vibration of a Body affected by *Sound*, may become so great as to be sensible to the Eye and Ear.

But where the terms of Vibration are not commensurate with the terms of concussion, the following pulses destroy the motion begun by the former, and the Vibration will never augment beyond what it was upon the first impressi^on.

Upon this Reason a string tuned in unison to another will manifestly shake when its fellow sounds, and another string that has a discording *Tone*, though of the same bigness, will not appear to be moved.

And for this Reason, wheresoever the vibrations of two sounding strings are equal, the pulses will be coincident: for although one should set out after the other, yet by this affection they would by the second or third pulse become coincident.

Where the terms are equal, and the coincidence is at every pulse, it may be said the same *Sound* though proceeding from several Instruments: for the mixed *Sound* has no alteration, but by being more loud and full by the addition.

Where the Termes are 2 to 1, or 4 to 1, or 8 to 1, or 16 to 1, there will be coincidence to every pulse of the Base, and between those termes the treble is heard alone without any mixture: so that the *Sound* is not changed but augmented by the addition of stronger pulses at proportionable intervals, which makes the pulses superinduced appear of the same nature, though more grave or acute; this is the case of *Organs*.

Where the Termes are as 2 to 3, every third pulse of the Treble, and every other pulse of the Base are coincident, but the intermediate pulses, *sc.* 2 of the Treble, and 1 of the Base are not so, but keep certain distances, which makes the mixture produce an alteration: but the coincidences being

ing so frequent, and the distances of the intermediate pulses proportionable, the mixture is very pleasing, and is the principal Chord called the fifth.

Where the Termes of coincidence are further off, as when they are but the fourth, fifth or sixth pulses of the Treble that are coincident with the third, fourth and fifth pulses of the Base, yet the mixture is pleasing, and produces Chords : which Chords are more or less perfect, according as they are more or less coincident.

Coincidence upon every fourth pulse of the Treble is the fourth.

Every fifth pulse is the third sharp.

Every sixth pulse is the third flat.

When the fifth pulse of the Treble goes with the third of the Base, it is a sixth sharp : the eighth pulse of the Treble going with the fifth of the Base makes a sixth flat.

That these Chords have their pulses in such proportionable line is demonstrable by the division of the Monochord, which being stopt, in $\frac{1}{2}$ gives an Octave, in $\frac{1}{3}$ gives a fifth, in $\frac{1}{4}$ gives a fourth, in $\frac{1}{5}$ gives a third Sharp, in $\frac{1}{6}$ gives a third Flat, $\frac{1}{7}$ gives a sixth Sharp, $\frac{1}{8}$ gives a sixth Flat : This is agreed by all that ever treated of *Musick*, therefore I shall speak no more of it.

It may seem strange that a Coincidence in this manner should unite *sounds*, and that the fifth and fourth pulses that are disagreeing should not hinder more, than the sixth coincident pulse could reconcile : and that a coincidence between the eighth pulse of the Treble with the fifth of the Base should make the *sounds* agreeable, notwithstanding the variance of those which are intermediate.

But this will be very clear, when it is observed that the intermediate pulses do not at all hinder, for they are all placed in such manner, in relation to one another, that where any of them distract the pulses of the concord string on the one hand, there are others that by being just as much on the other hand, set them right again : they are in balance

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one against another, so that it is as if there were no intermediate pulse at all, as to any effect of hindring the Coincidence.

And the intermediate pulses being at such symmetrical distances a new proportion arises from the mixture of them, which makes the joined *sounds* pleasing to the sense.

Where the coincidences are more remote, and all the intermediate pulses disagreeing, as 7 to 6, 8 to 7, 9 to 8, 10 to 9, the by pulses are too many to be kept steady, and the pulses on one hand prevail too far before those on the other hand come to set them right, so that the *sounds* will not maintain their coincidences, but produce jarring and discord.

When *sounds* are in discord, the concussions caused by them are in opposition one to another; and the Organ of Sense cannot be affected by both together, but they will appear ragged and jarring, and extream noisome. Nay some *sounds* will be so contrary to one another, & so hard a match, that they cannot sound both together, but each hindering the other will take turnes. Thus do they imitate the Drum in an Organ, by joyning two deep discording Notes, that rumble in that manner sounding by turns. And in tuning Organ-pipes it may be observed, that the *sounds* of two Pipes whilst in discord will flutter, but when the discording Pipe is brought to the others *Tone*, the *sounds* will as it were jump into Tune, as if they had attracted one another, and afterwards one clear and entire *sound* will be produced.

Upon this Relation of *Tones* depends the Scale of *Musick*, of which I shall shew the Degrees, and the reason why they are so placed, when I come to speak of *Schismes*.

Before I leave this Head I must observe, that Octaves not altering the manner of *sound*, but giving a fulness in duple proportions, which are comprehended in the same time, it follows, that all Octaves are easily brought in mind, and are as it were included in any *Tone*.

This being considered, it will appear, that there can be no other variety of coincidence within the compass of seven pulses that is not allowed in *Musick*, and produces some *Chord*; For,

$\frac{1}{2}$ is as $\frac{2}{1}$ 2 being the Octave to 1.

$\frac{1}{4}$ is as $\frac{4}{1}$ 4 being in Octave to 1.

$\frac{2}{3}$ as $\frac{3}{2}$, $\frac{3}{4}$ as $\frac{4}{3}$, $\frac{4}{5}$ as $\frac{5}{4}$, as $\frac{5}{6}$.

And the eighth coincident pulse in a sixth flat, comes in upon this contemplation, but as the reverse of a third sharp, $\frac{3}{4}$ being the reverse of $\frac{4}{3}$, and the other sixth $\frac{2}{3}$ is the reverse of $\frac{3}{2}$. So that there can be no other coincidences under the distance of the seventh pulse, but what have the names of Chords, or the Octaves; and we are not to wonder why there are no more concurring Notes.

How TONES are produced, and of assistances to the SOUND by Instruments.

WHerever a Body stands upon a Spring that vibrates in equal Termes, such a Body put into motion will produce a *Tone*, which will be more grave or acute, according to the velocity of the returns.

Therefore strings vibrating have a *Tone* according to the bigness or tension of them; and Bells that vibrate by cross ovals, produce Notes according to the bigness of them, or the thickness of their sides: and so do all other bodies whose superficies being displaced by force, results by a spring which carries it beyond its first station.

It is easie to comprehend how every pulse upon such vibrations causes *Sound*, for the gross Air is thrown off by the violence of the motion, which continues some moment of time after the return of the vibrating Body, whereupon some space must be left to that subtil matter, which upon the result of the Air starts as from a Centre; which action being the same I supposed to be the cause of *Sound*, is repeated upon every vibration.

It is more difficult to shew how *Tones* are made by a Pipe, where there are no visible vibrations. I will consider the frame of a Pipe, and the motion of the Air in it, and there-

by attempt to find the cause of the *Tone* of a Pipe, and the pulse that gives the *Sound*.

There is in any Pipe a Cavity of a certain gage or bigness which is exposed to the outward Air, but in some parts of it, and according to that Cavity is the *Tone* of the Pipe.

The Air in any Cavity being capable of being compressed by outward force, if the Cavity be large, easily yields to a compression; but if it be small, is more hardly compressed. When the compressing force ceases, the Body that was compressed with difficulty flies out with sudden violence; that which is more easily compressed restores it self not so soon: whereby it happens, that every Cavity has a certain *Tone* according to the measure of the vibrations of the Air in it, which it will keep what way soever the force comes to it: As the water in a Shallow or Creek moved by the large waves of the Sea, retains not a motion in such huge waves, but in waves proportionable to its own bigness and depth.

Hereupon I conclude, That any Pipe, whether made of Wood, Stone, Glass or Metal, has a certain and determinate *Tone*, according to its Gage and Cavity, which is the natural *Tone* which will be produced by blowing it. If the Cavity be small, the *Sound* will be acute, and may be made more acute by apertures, whereby the Cavity is diminished, and the inclosed Air exposed to the outward Air in greater measure.

When I say, the *Tone* is according to the proportion of the Cavity, let the Pipe be made of what it well; I do not deny but that if the materials of the Pipe be soft and yielding, it may give some small alteration to the *Tone* from what it would be if they were of a substance hard and firm, where the impelling Air would find a more brisk resistance: but the difference is inconsiderable, and the spring of the Air depending mainly upon the greatness of the Cavity, I take no notice of it.

To shew how the pulses are caused, whereby the included Air is put into this motion, it is necessary to observe the
frame

frame of a Pipe, which chiefly consists in having a long slit through which the Air is blown in a thin film against or very near a solid edge that is at some distance opposite to it, in such manner that the intermediate space is covered by the stream of Air. This film of Air on the one side is exposed to the outward Air, and on the inside is defended from it by the sides of the Pipe, within which the Air inclosed in the Pipe stagnates, whilst the outward Air is by the blast put into a vortical motion.

The vortical motion or Eddy on the outside is so strong, that there not being a balance to that force on the inside, the film of Air gives way, and the Eddy bears into the Pipe, but is immediately overcome by the blast, which prevails untill the Eddy overcomes it again; and so there is a crossing of streams by turns and pulses, which causes the voice of the Pipe, the gross Air of one stream being thrown off by the interposition of the other.

These vicissitudes or termes will answer the *Tone* of the Pipe according to the gage of its cavity: for the spring of the included Air helps toward the restitution of the blast and eddy in their turns, which causes those turns to comply with the *Tone* of the Pipe; and therefore the same blast will cause several *Tones*, if the gage or measure of the included Air be changed by apertures in the side of the Pipe.

But there must be some proportion between the mouth, (so I call that part of the Pipe where the voice is) and the gage of the Pipe: for though the pulses will be brought to comply with the *Tone* of the Pipe in any reasonable degree, yet when there is great disparity it will not do so; as if the Pipe be too long for the proportion of the diameter, the pulses at the mouth cannot be brought to so slow termes as to answer the vibrations of the included Air, therefore the Pipe will not speak unless it can break into some higher Note. If the filmy stream of Air be too thick, the Pipe will not speak, because the eddy cannot break through; if the opposite edge be too remote, the stream cannot entirely cover
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the aperture, for it mixes with the outward Air, and is more confused the farther it is from the vent or passage, whereby some outward Air may have communication to make an opposite eddy on the inside of the stream. For the same reason, if there be the least aperture in the region of the mouth of the Pipe, it will not speak at all.

Hence is it, that the voice of Organ Pipes is so tender and nice: but shrill whistles depend not upon this ground; for they are made in any small cavity where the blast is so applied, that the erumpent Air must cross it, whether the stream be thick or thin. Therefore the bore of a Key, a piece of nutshell, or any other cavity will make a whistle, whose *Tone* will be according to the quantity of the included Air, for the less that is, the harder it is to be compressed, and the quicker and stronger it must break forth.

Another kind of Whistle is, when a hollow body with a small cavity is perforated by opposite holes, a blast either way will cause a *Tone*, which seems to be made in this manner.

The Air that is violently drawn or thrust through these holes is straitned at the passage by the swiftness of the motion, and within the cavity is somewhat enlarged, and consequently its force is directed, and it presses beyond the compass of the opposite aperture, whereupon it bears of all sides into the cavity; hereby the Air within the cavity is compressed untill it breaks forth by crossing the stream, which being done by vicissitudes causes a *Tone*: this kind of action, as I imagine, is performed when men whistle with their lips.

In some Pipes the pulses are caused by springs, as the Regoll stop of an Organ, which is commonly tuned by shortning the spring whereby it becomes stronger, but the Note will be changed by the alteration of the cavity; and therefore to make them steddyy, some that stand upon very weak springs have Pavelions set to them.

A rustick instance may be given of the compliance of a Spring,

Spring, in taking such vibrations as are proportionable to the Cavity; It is a *Jew's-harp*, or *Jew's-trump*, the tongue whereof has natural vibrations according to strength and length of the Spring, and so is fitted to one particular *Tone*: But Countrey-men framing their breath and their mouth to several Notes make a shift to express a *Tune* by it.

In a *Shawm* or *Hautboys* the Quill at the mouth is a kind of Spring, but so weak and indifferent that it complies with any measure, and therefore the *Tone* will be according to the apertures of the Pipe.

The fluttering and jarring of discording *Sounds*, which I before did observe, is so regular, and the *Sounds* take their turns with equal interstices, which makes the joyning of them produce a harsher *Sound* than either had before: whereby *Organ-makers* imitate the *Hautboys* or *Trumpet*, without any Spring or Quill, by joyning discording Pipes.

In a *Sackbut* the Lips of a Man do the same office as a Quill does in a *Shawm* or *Hautboys*; when the included Air is lengthned, the *Tone* varies: nevertheless they can produce several Notes that are in Chord to the *Tone* of the Instrument, by strengthening the blast without lengthning the cavity: And in a *Trumpet*, which is the same kind of Instrument, (only not capable of being lengthned) they can sound a whole *Tune*, which is by the artificial ordering the blast at the mouth, whereby the *Sound* breaks into such Notes as are to be used.

This depends upon the consideration of the varying and breaking of *Tones* into other Notes, whereof I am to speak particularly in my next Chapter, to which I hasten.

Having shewed how *Tones* are produced by Instruments of *Musick*, I must take notice of other assistances Instruments give to the *Sound*.

In *Violins* and *Harpseichords* the *Tones* are made wholly by the vibrating strings, but the frame of the Instrument adds much to the *Sound*: for such strings vibrating upon a flat rough board would yield but a faint and pitifull *Sound*.

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○ The help that Instruments give to the *Sound*, is by reason that their sides tremble and comply with any *Sound*, and strike the Air in the same measure that the vibrations of the *Musick* are, and so considerably increase the *Sound*.

○ This trembling is chiefly occasioned by the continuity of the sides of the Instrument with the vibrating string: therefore if the bridge of a *Violin* be loaded with lead, the *Sound* will be damp; and if there be not a stick called the *sound-post* to promote the continuity between the back and belly of the Instrument, the *Sound* will not be brisk and sprightly.

Such a continuity to the nerve of hearing will cause a sense of *Sound* to a man that hath stopped his ears, if he will hold a stick that touches the sounding Instrument between his teeth.

The *Sound* of it self without such continuity would occasion some trembling, as may be seen by the moving the *Unison* strings in the Instance before given; but this is not considerable in respect of the other, though it be all the assistance that the structure of a Chamber can give to *Musick*, except what is by way of *Eccho*.

This tremble of the Instrument changes with every new *Sound*; the spring of the sides of the Instrument standing indifferent to take any measure, receives a new impression: but a vibrating string can take no measure but according to its tension.

Therefore Instruments that have nothing to stop the *sounding* strings make an intolerable jangle to one that stands near, as Bells to one that is in the Steeple, and hears the continuing *Sound* of dissonant *Tones*; such is the *Dulcimer*: but the *Harpsechord* that hath raggs upon the *jacks* by which the vibration of the string is staid, gives no disturbance by the sonorousness of the Instrument, for that continues not the *Sound* after the vibrations determined, and another *Tone* struck; but changes and complies with the new *Sound*.

Of the varying and breaking of TONES.

Tones will by accident vary and break into other Tones, which are Chords to the natural Tone of the Instrument: which in Pipes is so regular, that the compass of the *Musick* depends upon it; upon Strings it will happen, but not so gratefull to the ear, nor much in use. I will endeavour to explain how it is caused in Strings, and speak of Pipes afterwards.

A perfect string produces a clear *Sound* by entire and equall vibrations, there being no inequality to hinder the motion from being uniform from one end to the other, according to the Laws of a *Pendulum*: but if the string hath any inequality towards one end, it will yield a jarring and distracted *Sound*; for the resistances are not only at the ends of the string, but there are cross *tugges* that alter the course of the vibrations; which is evident in the manner whereby *Musicians* try if their strings be true: for if the string be true the vibrations will appear as a clear filme; but they will appear with cross threads if the string be false.

If there be a long string *Pendulum*, the motion will be uniform and synchronous from the bottom to the top: but if there be a weight fastned to the string towards the top, it will hinder the regularity of the motion; for the upper weight will be put into motion, and will have vibrations of its own, which will be mixed and confounded with the vibrations of the lower weight. In the same manner in a false string two or more sorts of vibrations are blended, which are not in proportion, but casual and discording, and therefore instead of a *Tone* produce an horrible jarr.

Now as a string by such small accidents is brought to vibrations of several parts of the string that hold no proportion one to another, much more easily may it be imagined to have vibrations of uniform parts, that shall be syn-

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chronous, and produce one single *sound*; as if the parts that vibrate severally are half parts, seconds or thirds of the string: and how this may be caused, I will enquire.

If a string *Pendulum* be very long, and the weight at bottom be not sufficient to cause the whole string to divide the Air; at first the *Pendulum* will be sustained by the resistance of the Air, and afterwards it will put the whole string into motion: but not that of a streight line, for the *Pendulum* will return before the direct motion performed at the top.

This will occasion thwarting of motions, which being balanced between the force at the bottom and the check at the top, the crossing point will settle in such a division of the string, that they will continue uniform till the force be spent.

I imagine, that if a musical string be so struck, that the whole string is not removed out of its place to cause the greatest vibration in the middle, there must be a crossing of vibrations: for before the motion communicated to the farther end, the part of the string that was struck may have restored itself to its first place. This crossing of vibrations, if the string be true, will be upon equal parts, and produce an Octave fifth, or some other Chord.

It is common experience, that a great string struck near the Bridge with a Bow where the Rosin takes but small hold, will whistle and break into chords above; which if it were struck by the thumb that removes it out of its place, would give the true *Tone*.

The *Trumpet marine* that sounds wholly upon such breaks, is a large and long monochord play'd on by a Bow near the end, which causes the string to break into shrill Notes. The removing the thumb that stops upon the string gives measure to these breaks, and consequently directs the *Tone* to be produced. The jarr at the Bridge takes the same measure and makes the *sound* loud, in imitation of a *Trumpet*, which otherwise would be like a *whistle* or *Pipe*.

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The touch of the Thumb less hinders the *Sound* of the string when it is upon the point where the vibrations cross, than when it is in any other part: for we see when any great string has an entire vibration, such a touch would immediately extinguish the *Sound*. This makes the *Trumpet Marine*, with the Thumb placed upon it, take to such a Note, as that the division of vibrations shall lye just under the Thumb.

Speaking of the counterfeit *Trumpet*, I must observe that the true one seems to give all its Notes by way of breaking, which causing the metal to jarr gives so loud a sound. I fancy the true gage of the Air included in a *Trumpet*, in comparison of its bore would fit an eight below the Note they call the Note of the *Trumpet*, because a fourth below it is so easily sounded, which is a fifth to the true *Tone*, in case it be placed eight Notes lower: As it easily divides into three to give a fifth, so it may well treble that division, and give a second to the *Trumpet* Note. And for the rest of the Notes which a *Trumpet* will easily produce, they are the third ♯, fourth, fifth and sixth sharp, which arise upon the most easie divisions of the monochord, and therefore most readily produced by breaking, when the strength of the blast and the action of the lips direct it. The *Trumpet* not being able to answer a flat Key, the *Sackbut* as I observed before is made in such manner that it may be lengthned to supply this defect, whereby it will give any Note at the pleasure of him that plays: but when he is to *Sound* an eighth or fifth above, he never lengthens the Instrument, for without any remove of his hand, the Note easily breaks into those higher Chords.

The *Trumpet* is of the nature of *Pipes*, and therefore properly leads me to speak of the varying Notes upon *Pipes*, which is so regular, and so much in use, that the compass of the *Musick* depends upon it.

I have shewed that *Sound* does cause a motion not only of solid bodies, but of the grosser parts of Air, within the sphere of it.

Now if the Air that is moved by being inclosed stands upon such a degree of resistance to compression, that it has a spring vibrating in the same measure with the sound that puts it into motion, there will be the same effect as when two strings are tuned in unison, that is, the motion will be so augmented by succeeding regular pulses, that the enclosed Air may be brought to ring and produce a *Tone*.

Vitruvius in his *Architecture* advises, that in making a *Theatre* there should be vases or hollow pots of several sizes to answer all the Notes of *Musick* placed upon the Stage in such manner, that the Voice of them which sang upon the Stage might be augmented by the ringing of them : And he mentions divers ancient *Theatres* where such were, in some of *Brass*, in some of *Earth*.

An *Organ-pipe* of a very deep *Base* will not speak suddenly when it is alone ; but if an *Octave* be in play at the same time, it will answer the quickest touch : because the *Tone* of the lesser Pipe being in chord causes a motion of the Air included in the greater Pipe, and the vibrations of the included Air being coincident with those of the *Tone* of the Pipe, promote its speaking by putting the pulses at the mouth into a regular motion, or at least assisting thereto.

These instances shew the manifest effects of *Sound* : and certainly *Sounds* in discord are in contrariety, and offer violence one to another ; but *Sounds* in *Musical Chords* are consistent, and united together, and promote each other, as I have before shewn in what I said concerning the Relation of *Tones*.

The synchronous motion of the pulses at the mouth of the Pipe with the vibrations of the included Air promote the *Sound* of the Pipe, and it is hard for a Pipe to speak where those motions are in opposition : but if by strengthening the blast the pulses at the mouth are so quickned that they bear a *Musical* proportion to the vibration of the Air enclosed, as 2 to 1, 3 to 2, 4 to 3, 5 to 4, &c. there will be no hindrance but some advantage ; so that it may be easily imagined

ned that the pulses at the mouth in such case will receive no interruption by the included Air, but may maintain their stations, and produce a *Tone* varying in the same proportion from the *Tone* of the Pipe.

It may be objected, that if it were so, there would be a mixture of *Sounds*; and not only the *Tone* that is in chord to the *Tone* of the Pipe would be heard, but also the *Tone* of the Pipe with it.

To which it may be answered, that the vibration of the included Air is not so considerable as to be heard distinctly, though it may give alteration to a *Sound*; as we see, that when a Pipe gives the true *Tone*, it speaks more in the belly than when it breaks into an Octave. But to wave that answer, perhaps when the Note breaks, the column of included Air divides into proportionable parts, by reason that the vibrating force at the mouth, and the resistance at the aperture meet one another in the middle, or upon other divisions, which will make the vibrations of the included Air coincident with every pulse at the mouth of the Pipe: which is the more probable, because a very small aperture in the middle of a Pipe will make it break into an eighth above, which seems not to happen by any diminution of the included Air, but interrupting the intireness of the Column.

Of the nature of Keys in MUSIC, and of a single TUNE.

BEfore any Note struck the Ear is indifferent to all *sounds*, but when any *Tone* is heard, that indifferency is determined, and the mind taken up with the present *sound*. If the second Note be not of relation to the first, the impression made by the first will be wholly obliterated and forgotten, the *sounds* will be disjoynted and incoherent: But if the second Note be of relation to the first, it is consistent with

with the memory of the first : if the third Note be more in chord to the first, then is that remembrance continued and strengthened : if succeeding Notes are in discord, or of less relation to the Key Note, the mind and fancy is drawn from the Key Note by the present *sound*; but by repeating the Key Note and its relatives with loudness and emphasis, the memory of the Key Note may be restored again.

Thus in passing to and from the Key, by Notes that have relation to the preceding Notes may a Tune proceed to any length, and amuse the hearer : but when the fifth, which is the principal chord to the Key, and most strengthens the memory of it, comes in play, nothing can be more perfect and satisfy expectation but the Key Note it self, which gives a perfect acquiescence to the hearer, and a conclusion to the Tune.

For this reason all Tunes end in the Key Note, and the next preceding Note is the fifth above.

In the progress of a long Tune other Notes may gain so great impression in the mind by dwelling upon the relatives to them, that the first Key may be forgotten, and the same way new Notes may gain possession, so that the Key may change many times. Thus it is in long Fancies and Preludes, and it is no matter in such case what Key the Tune concludes in : but in short Airy Tunes there are but small digressions, leaning to the fifth or third, or other relative Notes, and sometimes suddenly closing upon them, which does not destroy the memory of the first Key Note, and therefore the Ear is not satisfied with such close, but expects another strain, which ending in the Key Note concludes the Song.

Generally speaking, a Tune must begin and conclude in the Key Note, because that Note takes possession of the Ear; but this is not such a Rule but that sometimes a Tune begins or ends upon Notes relative to the Key; and the Key is shown by them, though it be not struck : as in the progress of a Tune the Key is to be traced by the relatives to it,

as well as by the Note it self: Hereby it appears that any Note may be the Key Note, as to the pitch: As to the species or sorts of Keys they are two, viz. Flat and Sharp.

When a Tune begins with a Flat third it must continue so; for the third being a relative to the Key Note, is joynd with the memory of it, and become as it were part of it, and a third Sharp being discord to it would disjoynt the Tune, though it be a better chord to the Key Note; it being necessary that the Tune should proceed with regard to the preceding Notes: for the same reason a third Sharp when once taken into play must be continued.

When the third is Flat or Sharp the sixth must be so likewise, else the third to the Key which is of principal regard and relation to the Key, and sometimes hath closes upon it, will have neither a fourth above, nor a fifth below in the Scale, but a false fifth, which could not set it off in that lustre it ought to have.

There is no natural difference betwixt the Musick in one Key Note or another; accidental differences there are: for in some Keys the emphatical Notes lying high are more sprightly than in others. Upon some Instruments, by reason of holdings, or open strings the emphatical Notes are of a mellow and durable sound, which gives advantage to the Key. Upon most Instruments the emphatical Notes are not in Tune, by reason of the Schismes of *Musick*, (whereof I am presently to speak) therefore such Keys are not in use, and when play'd upon yield but a harsh Tune. But these differences are but accidental, and relating to the advantages or imperfections of Instruments.

I shall collect from what hath been said, That the *Musick* of a single Tune consists in the succeeding Notes having a due relation to the preceding, and carrying their proper emphasis by length, loudness and repetition, with variety that may be agreeable to the hearer. This is called the formality of a single part, wherein *Musick* is so copious, that it has afforded to every Age and Nation a several fashion, and to every *Musician* a particular stile.

Graces

Graces in *Musick* depend upon the same reason with the formality of a single Tune, and skilfully applyed do much advance it, by strengthening the memory of preceding, and the expectation of succeeding Notes, the doing whereof is left to every Player.

Of SCHISMES, and the Scale of MUSICK.

There are *Schismes* in *Musick*, because the Scale is naturally fitted to one Key; and though it will indifferently serve to some others, yet it will not to all.

The Scale of *Musick* is not set out by any determinate quantities of whole Notes or half Notes, though the degrees are commonly so called; but the degrees in the Scale of *Musick* are fixed by the Ear in those places, where the pulses of the *Tones* are coincident, without any regard to the quantity. I shall endeavour to show how all the Notes come into the Scale by their relation and dignities; and then it will be obvious why for easiness of instruction and convenience the Scale of degrees of *Musick* is made as the *Musicians* now exhibit it.

The Key Note being given, the first Note in dignity is the fifth above, which must have its true place; for whilst the Tune is in the Key, it has the greatest emphasis; and upon any digression from the Key, this Note is nearest to usurp it: and therefore when the Chords to the Key Note are placed, the Chords to this Note are to be regarded, for without them there cannot be any variety, this being the first step from the Key.

The other Chords to the Key are the third *b* and \sharp , the fourth and the sixth *b* and \sharp .

The Chords to the fifth above the Key are the \sharp^d , and \sharp^{th} *b* and \sharp , which are the fifth and third *b* and \sharp to that Note.

When

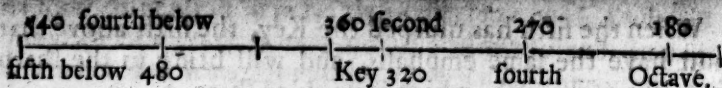
When the fifth has usurped the Key, the fifth above that must have the same emphasis, and will bring in the sharp fourth, or false fifth, which is its third sharp.

The half Note above the Key is farthest from the Keys relatives, and therefore the *sound* of it removes the dominion of the Key Note farther off than any other; the nearest way of bringing it in request is when the fifth below has usurped the Key, to which it is a sixth flat: The fifth below taking the Key makes an ingratefull remove, for it is not a Chord comprehended in the Key Note, but the Key Note is comprehended in that, and so it diminishes the regard to the Key Note more than any other, making the transition to the Key Note, not as a restitution, but as a digression to a secondary Key, which should not continue.

These are all the Notes of the Scale within the compass of an Octave, and by this method should they be Tuned, *Viz.* Third *b* and third *, fourth, fifth, sixth *b*, and sixth *, by the Key Note, second and seventh *b*, and seventh * by the fifth above the Key or its Octave; false fifth or fourth * must be third * to the second, and the \sharp Note above the Key must be a sixth *b* to the fifth below the Key.

An Instrument thus tuned will be exact to that one Key, and serve to play Tunes in that Key; but when the *Musick* turns to other Keys that are not relative to it, the divisions and degrees that fitted the first Key will not suite with the others, but must be removed, and thereby the *Schismes* appear, without which the Notes which ought to be principal and most perfect Chords to the new Key, will be manifestly out of Tune.

This will best appear upon view of the division of the Monochord, which I have set down in the plainest manner I could frame.

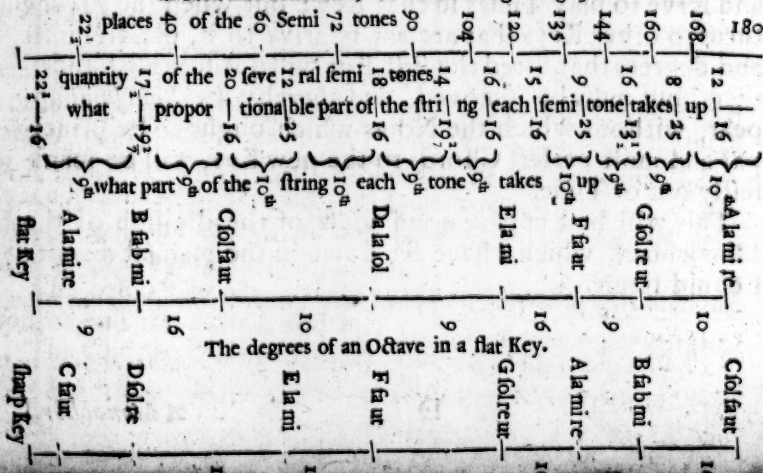


The Key Note is 360, whose division gives all the Chords.
 The fourth below is 480, whose division gives the 7th and second.
 The 3th below is 540, whose flat 6th is the half Note above the Key.
 The second is 320, whose third sharp is the false fifth.

The Divisions appear thus :

$\frac{3}{4}$ of 540 = 202 $\frac{1}{2}$ half note above the Key } Semitone is 22 $\frac{1}{2}$ sc. $\frac{11}{16}$ th part of the string.
 $\frac{4}{3}$ = 160 the second above the Key } Semitone is 17 $\frac{1}{3}$ sc. $\frac{33}{71}$ th } tone is 40 sc. $\frac{16}{25}$ th p^t of the string.
 $\frac{5}{4}$ = 60 the third flat } Semitone 20 sc. $\frac{11}{16}$ th part of the string } tone is 32 sc. $\frac{11}{16}$ th p^t.
 $\frac{5}{3}$ = 72 the 3^d sharp } Semitone 12 sc. $\frac{3}{10}$ th part of the string } tone is 32 sc. $\frac{11}{16}$ th p^t.
 $\frac{3}{2}$ = 90 the fourth } Semitone is 18 sc. $\frac{288}{16}$ th part of the string } tone is 30 sc. $\frac{11}{16}$ th p^t.
 $40 + \frac{3}{2} = 104$ the } Semitone is 14 sc. $\frac{27}{10}$ th of the string } tone is 32 sc. $\frac{288}{16}$ th p^t.
 (false fifth) } Semitone is 16 sc. $\frac{11}{16}$ th part of the string } tone is 30 sc. $\frac{27}{10}$ th p^t.
 $\frac{3}{2}$ = 120 the fifth } Semitone is 15 sc. $\frac{14}{16}$ th p^t of the string } tone is 24 sc. $\frac{14}{16}$ th p^t.
 $\frac{3}{2}$ of 360 = 135 the 6th flat } Semitone is 9 sc. $\frac{22}{25}$ th p^t of the string } tone is 24 sc. $\frac{14}{16}$ th p^t.
 $\frac{3}{2}$ of 360 = 144 the 6th sharp } Semitone is 16 sc. $\frac{4}{25}$ th p^t of the string } tone is 40 sc. $\frac{4}{16}$ th p^t.
 below } Semitone below the Key is 24 sc. $\frac{384}{16}$ th part of the string } tone is 40 sc. $\frac{4}{16}$ th p^t.
 $\frac{4}{3}$ = 96 seventh sharp } Semitone below the Key is 24 sc. $\frac{384}{16}$ th part of the string } tone is 40 sc. $\frac{4}{16}$ th p^t.
 below } Semitone is 16 sc. $\frac{4}{25}$ th part of the string } tone is 24 sc. $\frac{216}{16}$ th p^t.
 $\frac{4}{3}$ = 80 seventh flat } Semitone between sixth sharp above } 16 sc. $\frac{216}{16}$ th p^t of the string } tone is 24 sc. $\frac{216}{16}$ th p^t.
 seventh flat is }

Which is better represented to the view by the following Scheme, being an Octave divided into Semitones, the whole string being 360.



By these divisions it appears, that the *Tone* above the *Key*, and that between the fourth and fifth, and that between the sixth and seventh, whether flat or sharp, are ninths of the string, which is called the *Tone Major*; the other *Tones* are tenths of the String, and the natural *Semitones* are sixteenths.

Other *Semitones* which are placed in the Scale, by the Rules before mentioned have other proportions, because neither *Tone Major* nor *Tone Minor* can be divided into sixteenths: therefore if one *Semitone* be a sixteenth in a *Tone Major*, the other will be $19\frac{1}{2}$, and if one *Semitone* be a sixteenth in a *Tone Minor*, the other will be a 25^{th} , which is the *Somitone* that naturally lies between a third *b*, and a third \sharp . If a *Tone Minor* be so divided, that one *Semitone* is 25^{th} of the string, the other will be $13\frac{1}{2}$.

These unequal *Tones* and *Semitones* having their proper places in relation to the *Key Note* must needs produce Schismes upon displacing the *Key Note*. I shall give one instance: Suppose the *Key Note* a *Tone* lower, which is at 400 upon the Monochord in the first Scheme, then by the present Scale the fifth should fall upon the fourth to the former *Key*, which is 270, but by the division of the Monochord $\frac{400}{3}$ produces $133\frac{1}{3}$, whose complement is $266\frac{2}{3}$; so that the Schisme there is three and $\frac{1}{3}$, which makes a vast difference, and is occasioned, because, whereas there should be two *Tones Major*, one *Tone Minor*, and a *Semitone* to make a perfect fifth; this consists of two *Tones Minor*, one *Tone Major*, and a *Semitone*.

It will be easie, by turning the *Octave Line* divided into *Semitones* into a Circle, and supposing the *Key Note* upon other *Semitones*, to find the differences of the *Tones* and *Semitones*, that lye in order above it, from what they are in relation to the true *Key Note*, which will show more gross Disproportions or Schismes.

Quarter Notes have been invented, which placed in those parts where these Schismes are the greatest, make the In-

Instrument serve those Keys to which otherwise it would not be in tune. *Organs* and *Harpfechords* that have no quarter Notes are tuned with a'lowances, so that there is but one perfect fifth in the compass of an Octave, the rest bear on the one hand or the other, and so are indifferently well in tune to all Keys, but exactly in tune to none.

Harpes, *Lutes*, and *Lyra Viols*, that are tuned to a particular Key, will be well in tune without any regard to this.

Pipes may be helped by the strength of the blast, and fretted Instruments by a favourable stopping.

The *Violin* has a great advantage by not being confined to frets: but above all, the Voice is most excellent, because it is not any way confined, but carried by the ear to those degrees which make exact Harmony.

Of MUSICK consisting of several Parts in Consort.

MUSICK in Consort consists of *Harmony*, *Formality* and *Conformity*.

Harmony is the gratefull sound produced by the joyning of several *Tones* in Chord one to another.

I shewed before, that *Tones* in Chord one to another will joyn and give one entire sound, whereas discording *Tones* will jar; and also that some Chords were more perfect than other, according as the coincidence of their pulses was more frequent: It will be proper here to say something concerning the several natures of the Chords in conjunction, and the qualities of conjunct sounds.

In all conjunct sounds the Base is according to its name the foundation, and all the upper Chords are gratefull as they have relation to that, because it comprehends all the rest, and its pulses are according to Nature bigger and stronger

stronger than those of the other parts, and so of more effect to maintain the coincidence; and for this reason, where a Tune begins with conjunct sounds, the Base is always the Key Note.

Octaves as I have shewed before do not at all alter the sound, but only swell and fill it: for the sound has its quality from the terms of the interstices between the pulses; which if they are larger makes the sound more grave, if they be less, the sound is more acute: Now as in Division, the mode of the time is never alter'd by doubling the number of Notes in the same space of time, but the mind or memory couples them and comprehends them in the same space as if they were whole Notes; so is it by Octaves, being they increase by duplication of the pulses, in the same space of time it produces no alteration of the sound: And though there be Octaves above which are more acute, and Octaves below which are more grave, so that they differ from unisons; yet as to appearance they are the same, in respect of such difference as there is between other sounds; as if a man looks upon a Dye with the naked eye, and after should look upon it with a magnifying glass, though it appears bigger, yet by the figure and situation he judges it the same.

Therefore the *Musick* is not changed but filled by adding Octaves above the upper parts: but Octaves below the upper parts that should come below the Base, would change the *Musick*, by changing the foundation and basis of it, to which all the Chords would have other relations than they had to the former.

A fifth is the principal Chord (for the Octave cannot properly be called a Chord) in which there is an acquiescence; there being no other sound to which it can change to a more grateful one, and therefore is allowed in the close to fill the sound.

A fourth by its coincidence of pulses should stand in the second place, but it is not allowed in *Musick*, according

to the Sweetness of its sound, because its Octave below the Base mends the Harmony so much, that it cannot be kept out of mind, but will be desired and expected : and therefore a fourth is a binding Note that strongly induces a close in the fifth below. So that a fourth is not for its sweetness allowed to be a Chord by most *Musicians*, because it is not stable but subservient to a change, which change is more induced, because only a sixth can be joyned with it, which will be a third to the fifth below, and so increases the expectation of a change.

A third sharp is a Chord so gratefull that it is allowed in the close to fill the sound ; it being in Chord to the fifth bears it company, and its Octave to reverse would change the *Musick* into a sixth flat, which is the least pleasing of all Chords, and therefore is not at all regarded ; but the mind acquiesces in the third sharp.

A third flat, nor the sixth flat nor sharp, claim not any place in the close, because they are in discord to the third sharp and fifth, so that both cannot be allowed, and the other are preferred : but they are in the body of a Tune very gratefull Chords that never offend the ear, nor do they invite any change by their Octaves below the Base, but afford a stable and pleasant Harmony.

I shall not speak of discording *Tones* which are often conjoyned in *Musick*, because they are not allowed for their own sake, but for reasons which will appear in what I have further to say concerning Consort.

Wherein the second requisite is *Formality*, which every part ought to have, though not to that degree of pleasantness that is expected from a single Tune, yet in a reasonable degree.

The formality of a single Tune must be exact, because the Composer is not confined, but may follow his fancy; but in Consort the Composer must consider the harmony of the Parts conjunct, and therefore is not at liberty.

And there are allowances which the nature of the Parts require; the formality of the Treble must be airy and brisk, that of the Base slow and robust, the inner parts are generally employed to fill the *Musick* with Chords, and have little curiosity of formality, except upon following a point: but these allowances considered, an expert *Musician* will give a competent share of formality and sweetness to every part, making the Treble move in a grave pace, and the Base rest, that the beauty of the inner parts may be discerned.

The third requisite of *Musick* in Consort is *Conformity* of all the parts: as the Formality of a single part requires, that the succeeding Notes should be agreeable to the former; so Conformity requires that each part should have the like tendency to the succeeding Notes.

Which tendency is many times so regarded, that the present Harmony must yield to it: for if the succeeding Notes are of great relation to the Key, and the formal way to them in the several Parts is by discording Notes; nevertheless that way which gives so good expectation must not be balked, but rather the discords will be allowed, whose harshness is taken off by the expectation of the succeeding Chords, and the Harmony of the following Notes is the more welcome for the badness of the passage.

Discords are allowed in *Musick* upon this score, and they are also in other respects of excellent use; as when the mind is to be carried from any particular Note, it may be affronted by a discord; or if a Note in small esteem be to be

be favoured, some other Note may come in that agrees with that, and is discord to the rest, and so may draw the mind to the regard of that Note which it strengthens and supports. Infinite other instances may be made, but my business being only to illustrate the Reasons I go upon, and not to teach Rules, these shall suffice.

From what I have said, it appears, that when each part has its kind and proportion of formality, and the parts are in Chord to the Base, and not in discord to one another, but carry all the Chords to fill the Harmony, when they have a like tendency to their respective succeeding Notes, when they imitate one anothers measure; then is the Consort compleat: for the ear is pleased with the Harmony, and the mind is amused and entertained to observe the particular Parts how they dance to and from the Key, and from one Key to another, how they hunt one another, and in a manner imitate humane passions.

To the end the hearer may the more indifferently observe the contexture of the Parts, it is necessary that they be fairly interwoven, one Part must not cling to another, by moving together in eighths or fifths which would draw the attention too much: for the same reason they may not jump into eighths, which I have heard called, hitting an eighth in the face; but an equall hand should be held over all the Parts, and the sweetness distributed amongst them.

I will not go about to describe Excellent *Musick*, which would require a *Poet* as well as a *Musician*; I am only in the part of a *Philosopher*, to show what is allowable *Musick*, in order to make the Reasons upon which their Rules are founded understood.

And that I have done, as it were by a glimpse, knowing the difficulty of being exact upon such a Subject; He that desires

desires to be more fully informed concerning it, may have recourse to other large Treatises that have been written of *Musick* by Authors of our own, as well as other Nations.

There are tricks in *Musick*, as *Fugues*, *Points*, *Descant upon plainsong Cannons*, &c. the former, *scil.* *Fugues* and *Points* are extream delightfull, and embellish the *Musick*, carrying the attendance of the mind from one part to another, and restrain not the fancy of the Composer, but advance it.

The other tricks that are more elaborate, are to teach or shew mastery in Composing, rather than to please; for such fetter'd *Musick* is alwayes worse, and the hearer shall not observe the Art till he be told of it: it is like Acrostick Verse, or rhithm in Plays, which shew skill or labour, but serve not those ends for which the pieces were designed.

Of TIME, or the measures of MUSIC.

AS the *Musick* and *Harmony* of *Tones* depends upon the regular distance of the pulses, though the interstices are not perceived, nor can be measured by us: So when the interstices are so large that they can be measured by our sense, the observance of a regular proportion of *Time* affords great pleasure; as in the beating a *Drum*, or striking a pair of *Castanets*.

The due observance of time is gratefull for the same reason that I gave for the formality of a single *Tune*, because the subsequent strokes are measured by the me-

memory of the former, and if they do comprehend them, or are comprehended by them, it is alike pleasant, the mind cannot chuse but compare one with the other, and observe when the strokes are coincident with the memory of the former.

Therefore the less the intervals are; the more grateful is the measure, because it is easily and exactly represented by the memory, whereas a long space of time that cannot be comprehended in one thought, is not retained in the memory in its exact measure, nor can abide the comparison, the time past being alwayes shortned by so much as it is removed from the time present.

The modes of *Time* are very few, being only in duple or triple proportion, and the diminishing is alwayes in Geometrical proportion, as two, four, eight, sixteen; that it might serve not only to the Basis of the *Time*, but also to the other intermediate degrees of diminution, which are in memory, if not in play.

The triple can give two spaces to one, the duple can give three spaces to one, and although the duple or plain *Time* seems to have spaces of even length, yet there is loudness and briskness given to every other pulse, which makes it eminent, and alwayes happens upon coincident strokes: this difference is between the fore-stroke and back-stroke in *Musick*, where the Notes are marked to be of an even length.

These disparities of even and odd, and of two to one, and three to one are necessary, not only where *Time* alone is regarded, as in a *Drum*, or upon a *Horn*, to show the coincident strokes; but in respect of *Musick*, for thereby length and loudness is given to the Key Notes, and
such

such other Notes as should bear an emphasis : and the other Notes that have the short or odd foot, seem but steps and passages to them, and indeed are so little regarded, that whether Chord or Discord they must be taken if they lye in the way. In the same manner, in all shaking graces the hovering is unequal betwixt two Notes, the advantage is given to the true Note, and the other has but faint touches, to make preparation for that which is to succeed.

It is now time to put bounds to this Discourse, which by reason of the Method I engaged my self in, is become much longer than I intended ; I will only add these Two Observations :

1. It appears plainly how *Musick* comes to be so copious : for considering the species of Keys, the number of them, the variety of Chords, the allowable mixing of Discords, the diversity of measure, it is not to be wondered at, that it should like Language afford to every Age, every Nation, nay, every Person, particular stiles and modes.

2. It appears that *Tones* or *Modes* of *Musick* in antient time could not be of other kinds than are now ; for there can be no other in Nature : therefore the great effects it then had, if truly related, must be imputed to the rarity of it, and the barbarity of the People, who are not transported with any thing after it becomes common to them.

F I N I S.

MISTAKES.

Page 9. l. 18. for *line* read *time* : l. 25. for *fifth and fourth* read *five and four*.

Pag. 24. l. penult. for $\frac{1}{2}^d$ and $\frac{1}{2}^{th}$ b read 2^d and 7^{th} b

Pag. 30. l. 13. for *Octave so reverse* read *Octave or reverse*.

Pag. 15. l. 12. so regular dele so.

Pag. 26. It must be observed that the *Monochords* are not divided as they ought to be; the *Reader* therefore is to regard only the *Figures*, and not the length of the *Lines*.

